
Two New Trifoliolate-Leaved Species of Cucurbitaceae (Cucurbiteae) from Central and South America

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ABSTRACT. Two new species of Cucurbitaceae, tribe Cucurbiteae, with trifoliolate leaves are described from Costa Rica, one each in *Cayaponia* Silva Manso and *Cionosicyos* Grisebach. *Cayaponia hammelii* Grayum, with large, pendent staminate flowers, ranges from Costa Rica to Pacific Ecuador, while the exceptionally large-fruited *Cionosicyos guabubu* Grayum & J. A. González is restricted to Nicaragua, Costa Rica, and central Panama. Both of these new species have sometimes been misidentified as *Cayaponia granatensis* Cogniaux, a species with trilobate leaves that is dubiously present in Mesoamerica. The distinction between *Cayaponia* and the similar *Cionosicyos* is discussed in some detail, and a key is provided for all species of *Cionosicyos* with validly published names.

Key words: *Cayaponia*, *Cionosicyos*, Colombia, Costa Rica, Cucurbitaceae, Cucurbiteae, Ecuador, IUCN Red List, Nicaragua, Panama.

The most recent classification of Cucurbitaceae (Jeffrey, 2005) divides that family into two subfamilies, with a total of 11 tribes and 14 subtribes. The overwhelmingly Neotropical tribe Cucurbiteae comprises 13 genera, by far the largest of which is *Cayaponia* Silva Manso. Although the system of Jeffrey (2005) foregoes subtribes in tribe Cucurbiteae, the same author had previously (Jeffrey, 1971) segregated *Cayaponia* into subtribe Abobrinae Pax, together with the oligotypic, New World genera *Abobra* Naudin, *Cionosicyos* Grisebach, and *Selysia* Cogniaux. He regarded the relationship between *Cayaponia* and *Cionosicyos* as especially close, entertaining the notion that the latter genus should “be reduced to the rank of a section within *Cayaponia*” (Jeffrey, 1971: 200), but decided to maintain *Cionosicyos* on the sole basis of its larger, pepiniform (vs. berry-like) fruits. That decision appears to be supported by the results of a recent molecular study (Schaefer et al., 2009) discussed later in this paper. With these considerations in mind, two new species are described below, one each in *Cayaponia* and *Cionosicyos*, in anticipation of a forthcoming volume of the *Manual de Plantas de Costa Rica*.

CAYAPONIA

The genus *Cayaponia*, one of the largest in Cucurbitaceae with an estimated 60 species (Jeffrey, 2001), is widespread in the New World from the southern United States to Argentina, and has one or two species in Africa and Madagascar. *Cayaponia* is distinguished by its leaves usually with sessile glands abaxially (at least near the base), generally racemose inflorescences, staminate flowers with three distinct stamen filaments and coherent anthers, pistillate flowers with three broad, reflexed stigmas, and fleshy, indehiscent, generally berry-like fruits. Although a synopsis was provided by Jeffrey (1971), the most recent monograph of *Cayaponia* is that of Cogniaux (1881), leaving the genus “in fairly desperate need of a thorough revision” (Jeffrey, 1971: 201). Nevertheless, I feel confident in having been able to establish the following species as new to science.

Cayaponia hammelii Grayum, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce, Península de Osa, Dos Brazos de Río Tigre, 300 m, 3 Dec. 1990, G. Herrera 4684 (holotype, INB; isotypes, CR, MO). Figure 1.

Species nova caulibus juvenibus sicut inflorescentiae axibus dense vestitis trichomatibus glandulosis brunneolis, cirrhis plerumque simplicibus, foliis trifoliolatis membranaceis ventraliter hispidulis atque corolla florum staminatorum ca. 17–38 mm longa tubo lobis ut minimum 3-plo longiore a congeneris diversa.

Vine, sometimes hanging, monoecious; stems sparsely strigillose to moderately pilosulose and densely beset with minute, sessile or (less commonly) stalked, brownish glands, glabrescent; tendrils unbranched or (rarely) 2-branched. Leaves with petiole 1.5–6.5 cm; lamina compound, trifoliolate, with petiolules 0.05–0.9(–1.5) cm; medial leaflet 4–13.5 × 2–7.2 cm, elliptical to obovate, narrowly to broadly cuneate at the base, acuminate to caudate at the apex, remotely denticulate (especially distally) or entire, pinnately 4- to 7-nerved, membranous, glabrous and uniformly verruculate adaxially, minutely pubescent along midrib and larger main veins, uniformly

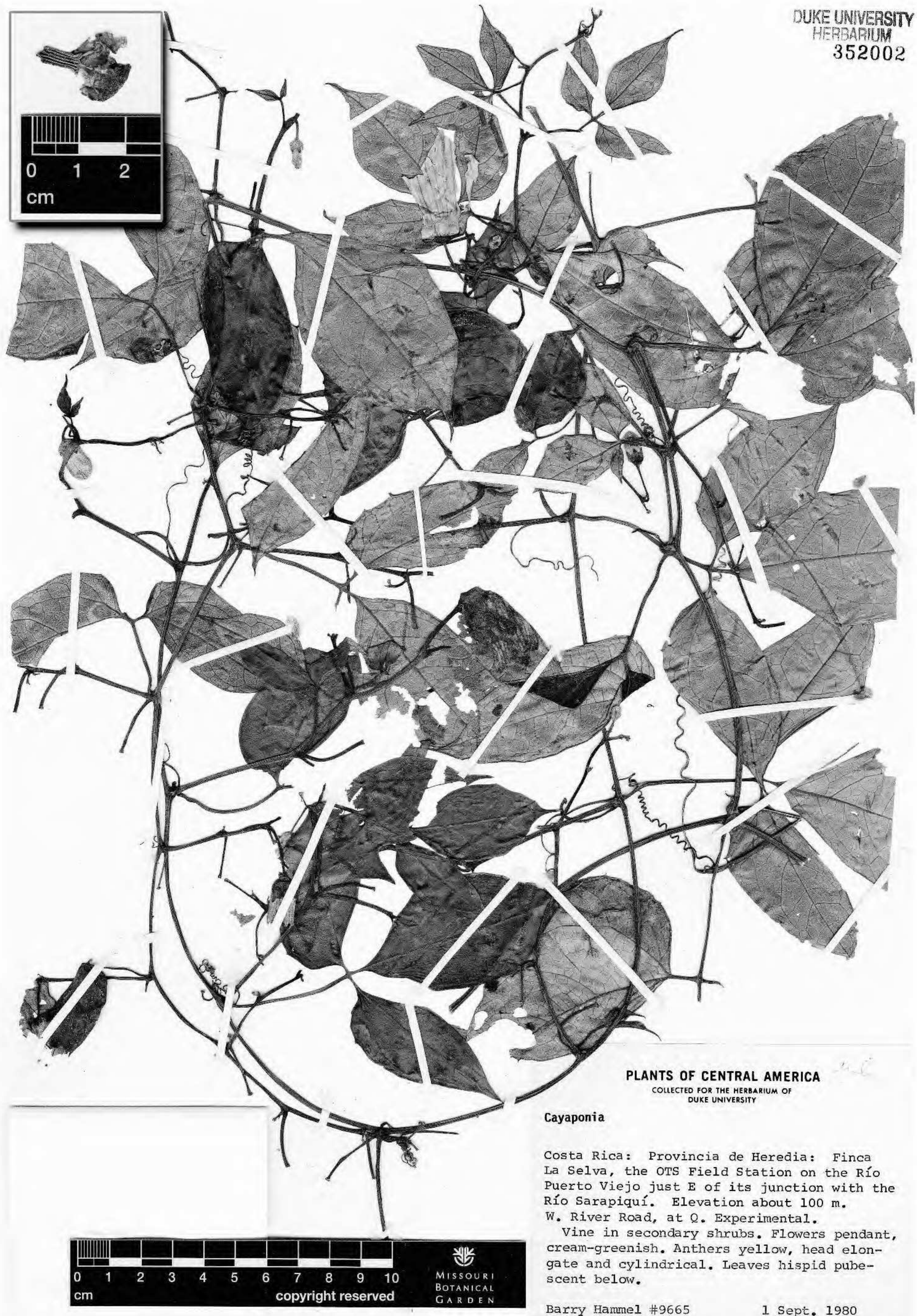


Figure 1. *Cayaponia hammelii* Grayum, flowering specimen (Hammel 9665, DUKE). Inset: staminate flower, with corolla partly removed to show androecium.

pustulose-hispidulous abaxially, minutely pubescent and with sessile or stalked, brownish glands along midrib and larger veins, usually with 1 to several larger, flat or immersed glands toward base; lateral

leaflets asymmetrical, oblique at base, occasionally lobed (Hammel *et al.* 19383). Inflorescences of 1 solitary flower, or racemose with the rachis to ca. 4 cm. Staminate flowers pendulous, to at least 25 mm

diam., 5-merous, with pedicel 7–17 mm; hypanthium ca. 9–12 mm, ca. 11–17 mm diam., cupulate, \pm uniformly and moderately pubescent, the sepals erect, ca. 0.5–2 mm, narrowly to broadly triangular; petals connate for at least 3/4 their total length in a greenish cream or yellowish white, campanulate corolla ca. 17–38 mm, \pm uniformly puberulent externally with both glandular (at least distally) and nonglandular trichomes, glabrous internally toward base, villous distally; stamens inserted ca. halfway toward base of receptacle; filaments 3, distinct, 2–4 mm, with dense, unilateral tuft of uniseriate trichomes near base (on inner side); anthers coherent, forming a cylindrical head ca. 8–13 mm, the thecae tightly replicate vertically. Pistillate flowers not seen at maturity. Fruits yellowish green, 2.7–4 cm, subglobose, the surface with obscure to conspicuous polygonal pattern (at least when dried), with pedicel ca. 1–4.5 cm; seeds ca. 7 to 11, of undetermined orientation, of unspecified color when fresh, 12–14 \times 8–10 mm, broadly oblong to elliptical, strongly compressed.

Distribution and habitat. *Cayaponia hammelii* occurs in tropical wet forest (Tosi, 1969), at elevations of about 50 to at least 1000 m, from Costa Rica (on both Atlantic and Pacific slopes) to the Pacific slope of Ecuador.

IUCN Red List category. Although it is relatively widespread, *Cayaponia hammelii* has been found only sporadically by collectors. It may be rare, or possibly just inconspicuous or seldom fertile. Certainly it is remarkable that it has been collected just once at the La Selva Biological Station in Costa Rica, one of the most intensively botanized sites in the Neotropics over the course of the past 30 years. This is a species of primary forest, dependent on the continued availability of that habitat. At least in Costa Rica, it has been collected principally (if not exclusively) in public or private preserves; as long as these areas remain secure, the future of *C. hammelii* should be secure as well. Because population size and extent have not been established or monitored for this species in any part of its range, it must be classified as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Phenology. Mature flowers have been gathered in January, June, September, October, and December (Costa Rica) and July (Ecuador), and fruits in February and March (Colombia), April (Panama), and June and October through December (Costa Rica).

Etymology. The epithet honors Barry E. Hammel of the Missouri Botanical Garden, my colleague on the *Manual de Plantas de Costa Rica* project, who has

long taken an interest in Cucurbitaceae and was the first to collect both species described in this paper at the La Selva Biological Station in Costa Rica.

Discussion. *Cayaponia hammelii* is distinguished by the combination of generally simple tendrils, compound (trifoliolate), membranous, abaxially hispidulous leaves, and pendent staminate flowers with the petals connate for at least 3/4 of their total length in a relatively large, campanulate corolla. Also distinctive is the brownish glandular pubescence of the young stems and inflorescence axes. The berry-like fruits of this species are large enough to satisfy some concepts of *Cionosicyos* (see the discussion under that heading), but have a relatively thin, brittle shell rather than a leathery rind. Some specimens of *Cayaponia hammelii* have been misidentified as *C. buraevii* Cogniaux or *C. granatensis* Cogniaux. Although it may also have trifoliolate leaves, *C. buraevii* occurs at higher elevations than *C. hammelii* (1300–1700 m, in Costa Rica) and has more coriaceous leaves, as well as much smaller flowers (hypanthium ca. 4–4.5 mm diam.; corolla ca. 6–7 mm) and smaller fruits (ca. 1.2–1.5 cm) with fewer seeds (2 or 3). According to its protologue (Cogniaux, 1881: 794), *C. granatensis* differs from *C. hammelii* in having trilobate leaves (“ultra medium trilobatis”), as well as 3-branched tendrils and larger (ca. 6 \times 3–4.5 cm), ovoid fruits that are (as specified in Cogniaux’s key to *Cayaponia* species) 1-seeded. The *Cayaponia* species key in Cogniaux (1881: 739–743) does not accommodate a species with the combination of characters seen in *C. hammelii*, viz., simple tendrils, trifoliolate leaves with petiolulate, abaxially hispidulous leaflets, and flowers with the sepals much shorter than the hypanthium. I have checked all seven *Cayaponia* species described subsequently from within the geographic range of *C. hammelii*, as well as the trifoliolate-leaved species described from other regions (e.g., Jeffrey, 1978; Gomes-Klein, 2003; Gomes-Klein & Pirani, 2005), and found none that matches.

Some further consideration of *Cayaponia granatensis* is warranted, as that name has been applied uncritically in herbaria to several different *Cayaponia* species (probably at least four in the Mesoamerican region) with trilobate leaves, as well as to some species (at least three) of both *Cayaponia* and *Cionosicyos* with trifoliolate leaves. My concept of *C. granatensis* is based on the protologue, supplemented by color photos of an isolectotype (*Karsten s.n.*, BR; lectotype designated by Jeffrey, 1971: 217) and one of the other original syntypes (*Triana 2998*, P), both of which were collected in Meta Department, Colombia. I have also seen a modern collection from Meta Department bearing Jeffrey’s annotation (*Callejas &*

Marulanda 6009, MO). Although none of this material is floriferous (and flowers were unknown to Cogniaux), *C. granatensis* is well characterized vegetatively by its consistently simple, trilobate leaves. The various trilobate-leaved *Cayaponia* species occurring in the Mesoamerican region have yet to be rigorously sorted out, and it is possible that one may prove conspecific with the type of *C. granatensis*; however, the last-mentioned name may be safely rejected for the trifoliolate-leaved species of *Cayaponia* and *Cionosicya* to which it has been applied, including both of those described herein.

I have seen just a few pistillate flowers of *Cayaponia hammelii* (Estrada et al. 1862; Herrera & Martínez M. 2219), in what I assume to be very young bud. Because I do not definitely know the mature pistillate flowers of this species, I am unable to assign it to one of the two sections accepted by Jeffrey (1971), whose infrageneric classification relies solely on stigma morphology.

Paratypes. COSTA RICA. **Cartago:** Parque Nac. Barbilla, Sendero Barbilla, por la loma, E. Mora & E. Rojas 1598 (CR, INB). **Heredia:** Finca La Selva, OTS Field Station on Río Puerto Viejo just E of jct. with Río Sarapiquí, B. Hammel 9665 (DUKE [2]); Cantón de Sarapiquí, La Virgen a Magsasay por La Tirimbina, B. Hammel, Jiménez, Lépiz, Ramírez & Rueda 19383 (INB). **Limón:** Cantón de Matina, Cordillera de Talamanca, entre Río Barbilla y Quebrada Cañabral, G. Herrera & H. Martínez M. 2219 (INB). **Puntarenas:** Cantón de Golfito, Península de Osa, Estero Guerra de Sierpe, A. Rodríguez 744 (CR, INB). **San José:** Pérez Zeledón, Savegre Abajo de Río Nuevo, A. Estrada, J. Solano, H. Gómez & H. Cordero 1862 (CR, MO). PANAMA. **Coclé:** Alto Calvario, New Works, J. P. Folsom & J. Kauke 2631 (MO). COLOMBIA. **Antioquia:** Mpio. Frontino, Vereda Venados, Parque Nac. Nat. Las Orquídeas, Quebrada La Manzanares, J. Pipoly, J. Ramírez, J. Arias, O. Álvarez, G. Muñoz & F. Ramírez 18228 (MO, NY). **Valle:** Mpio. Restrepo, Vereda Río Bravo, Vía El Pital La Cristalina, Proyecto Calima III CVC, W. Devia 1146 (MO). ECUADOR. **Pichincha:** 24–25 km by rd. E of Patricia Pilar, G. L. Webster, R. Lockwood & K. Steiner 22789 (MO).

CIONOSICYA

The genus *Cionosicya* has generally been regarded (following Jeffrey, 1971) as comprising three or four species, ranging from southern Mexico to Panama and the Greater Antilles (Cuba and Jamaica). *Cionosicya* was established by Grisebach (1864) on the basis of the Jamaican endemic *C. pomiformis* Grisebach and persisted as monospecific for more than a century thereafter. In 1971, Jeffrey moved *Cionosicya* into subtribe Abobrinae (from subtribe Cucurbitinae, where he had previously maintained it), emphasizing the simple (unbranched) tendrils of *C. pomiformis*. This action brought *Cionosicya* into closer proximity with *Cayaponia* and precipitated Jeffrey's transfer, in

the same paper, of two large-fruited, Mesoamerican species, then known as *Cayaponia excisa* (Grisebach) Cogniaux and *C. macrantha* Pittier, into *Cionosicya* (despite the fact that both have generally branched tendrils). Although Jeffrey (1971: 200) admitted that his reconfigured *Cionosicya* could be distinguished from *Cayaponia* "solely by the fleshy peponiform fruit, as contrasted with the typical fibrous berry of the latter," he considered this to be an "important enough" biological difference to justify their generic segregation.

There have been no additional revisionary studies involving either *Cayaponia* or *Cionosicya* since Jeffrey (1971). However, the genus *Cionosicya* has been maintained in a number of floristic accounts, mostly authored by contemporary Cucurbitaceae specialists. For the most part, the distinction between *Cayaponia* and *Cionosicya* has been expressed, in these accounts, in dichotomous keys, often by means of artificially constructed couplets designed to expediently pigeon-hole the local taxa. The couplet employed by Adams (1972) to separate *Cionosicya pomiformis* from *Cayaponia* relied on inflorescence structure: solitary or clustered flowers or racemes in the former, panicles in the latter. Dieterle (1976) utilized the size of the staminate flowers (petals 5–7 mm long in *Cayaponia* vs. 15–20 mm in *Cionosicya*) and the size and nature of the fruits (1–2 cm long and thin-walled in *Cayaponia* vs. 3–5 cm and thick-walled in *Cionosicya*). Nee (1993) also employed fruit size (0.8–1 cm diam. in *Cayaponia* vs. 6–12 cm diam. in *Cionosicya*), as well as seed number (2 or 3 in *Cayaponia* vs. ca. 15 to 25 in *Cionosicya*). Lira Saade (2004: 21) added seed orientation ("en posición vertical" in *Cayaponia* vs. "en posición horizontal o ligeramente ascendentes sólo en la porción inferior del fruto" in *Cionosicya*). Although these differences may seem dramatic, it must be noted that Lira Saade treated a single *Cayaponia* species, *C. racemosa* (Miller) Cogniaux, and both Dieterle and Nee only *C. attenuata* (Hooker & Arnott) Cogniaux and *C. racemosa*; these two species have among the smallest flowers and fruits in the genus, as well as the fewest seeds per fruit. Wunderlin (1978), who had six *Cayaponia* species to contend with for Panama, quoted the standby fruit difference (berry vs. peponiform), but also introduced a new character: petal connation. According to his keys to genera, the flowers of *Cayaponia* are characterized by having the "petals free nearly to the base," as opposed to "connate over half their length" in *Cionosicya* (Wunderlin, 1978: 287). This notion, however, was contradicted by his own genus description, in which the staminate corolla of *Cionosicya* is said to be 5-lobate almost to the base. Moreover, Wunderlin's illustration of *Cionosicya*

macranthus (Pittier) C. Jeffrey depicted a flower with distinct petals. Grisebach (1864), Dieterle (1976), Nee (1993), and Jeffrey (2001) converged in describing the staminate corolla of *Cionosicya* as deeply 5-parted or 5-parted almost to the base, although Dieterle's (1976: 323) illustration of *C. macranthus* appears to show the staminate petals connate to near the middle or beyond. Jeffrey (2001), in his key to genera, characterized *Cayaponia* as having small, numerous flowers in racemes and fruits 1–2 cm long, as opposed to *Cionosicya*, which has large, solitary or less numerous flowers and fruits 3–6 cm long. However, closer inspection of his species descriptions reveals overlap in both floral and fruit dimensions.

My own observations only serve to further blur the distinction between *Cayaponia* and *Cionosicya*. While it may be true that *Cionosicya excisus* (Grisebach) C. Jeffrey and *C. macranthus* have many solitary flowers, at least the former also has flowers in racemes; furthermore, most *Cayaponia* species have at least some solitary flowers, and in a few (e.g., *C. macrocalyx* Harms) the flowers are principally or exclusively solitary. The staminate corolla in *Cionosicya excisus* and *C. macranthus* measures ca. 15–25 mm, which is indeed relatively long by *Cayaponia* criteria; nevertheless, corollas of comparable length occur in numerous *Cayaponia* species, e.g., *C. glandulosa* (Poeppig & Endlicher) Cogniaux (8–21 mm), *C. macrocalyx* (ca. 11–38 mm), and *C. sessiliflora* Wunderlin (ca. 8–17 mm). Many *Cayaponia* species have the petals of the staminate flowers distinct to near the base, as reported for *Cionosicya* (see above), but in other species they are connate to near the middle (*Cayaponia glandulosa*) or beyond (*C. macrocalyx*). Most of the floras cited previously describe the fruits of *Cionosicya excisus* and *C. macranthus* as ca. 3–7 cm in length (or diam.; they are subglobose), and my measurements concur. Again, this is on the large side for *Cayaponia*, but overlap does occur: the fruits of *Cayaponia granatensis* measure ca. 6 cm (Cogniaux, 1881: 794), those of *C. macrocalyx* ca. 2.5–3.5 cm, and those of *C. sessiliflora* ca. 3–4.5 cm. The fruits of *Cionosicya pomiformis* were reported to have 27 seeds (9 per cell) by Grisebach (1864), while Nee (1993) characterized the genus as having fruits with ca. 15 to 25 seeds. *Cayaponia* typically has just one to 12 seeds per fruit (Cogniaux, 1881), but *C. glandulosa* may have as many as 15 (Wunderlin, 1978). To some extent, seed number is no doubt correlated with fruit size; seed orientation may be as well, and is often difficult or impossible to evaluate in the herbarium.

But if *Cionosicya* fruits cannot be sharply distinguished from those of *Cayaponia* on a mensural basis, there does seem to be a qualitative difference, as generally expressed by the adjective peponiform. The

fruits of *Cionosicya excisus* and *C. macranthus* have a thick, leathery rind, and their seeds are firmly embedded in a dense pulp that adheres tightly to the inner surface of the rind. By contrast, typical *Cayaponia* fruits (when dried) have a relatively thin, brittle shell (e.g., as in *Passiflora ligularis* Jussieu), and the mass of seeds and pulp pulls away from the inner surface of the shell. The *Passiflora* L. analogy is worthwhile, for within that genus (which, admittedly, is much larger than *Cayaponia*) can be found a greater range of fruit sizes and types than occurs even in *Cayaponia* and *Cionosicya*, from thin-walled berries ca. 1 cm long (e.g., *P. apetala* Killip) to leathery-rinded, peponiform fruits 10–30 cm long (e.g., *P. ambigua* Hemsley, *P. quadrangularis* L.). Similar variation in fruit types can be seen in *Solanum* L. (e.g., *S. americanum* Miller, with tiny berries 0.5–0.8 cm diam., vs. *S. gomphodes* Dunal and *S. lycocarpum* A. St.-Hilaire of South America, with fruits ca. 15 cm diam.; M. Nee, pers. comm.).

The morphological distinction of *Cionosicya* from *Cayaponia* would thus distill to: larger-than-average (3–6+ cm), peponiform fruits with more than 14 seeds. However tenuous this may seem, a recent molecular analysis of Cucurbitaceae, based on chloroplast DNA sequences, provides some cladistic support for the generic separation. This extensive study (Schaefer et al., 2009), involving all but one of the 115 genera in the family and a quarter of its species, portrayed most of Jeffrey's (2005) tribes as monophyletic, including the Cucurbiteae. His subtribes did not generally fare so well, but the four genera of subtribe Abobrinae sensu Jeffrey (1971) do comprise a monophyletic group, albeit nested among genera of his subtribe Cucurbitinae. *Cionosicya* (represented by *C. macranthus*) was basal within this group, sister to the clade harboring *Abobra*, *Cayaponia*, and *Selysia* (Schaefer et al., 2009: 845).

***Cionosicya guabubu* Grayum & J. A. González, sp. nov.** TYPE: Costa Rica. Guanacaste: Parque Nac. Rincón de la Vieja, sector del canal, 1 km al E de la Administración, 800–900 m, 4 Mar. 1991, G. Rivera 1144 (holotype, INB; isotypes, CR, MO). Figures 2, 3.

Species insignis foliis (2 vel)3(ad 5)-foliolatis, floribus staminatis grandibus corolla aliquanto carnosae antheris capitulum globosum formantibus thecis valde contortis atque fructibus magnis pulpa alba seminibus numerosis a speciebus mihi notis bene distincta.

Vine or liana, climbing to at least 30 m, apparently monoecious; stems glabrate; tendrils 2-branched (with 1 branch sometimes vestigial). Leaves with petiole ca. 0.9–5.5(–7) cm; lamina compound, trifoliolate (rarely

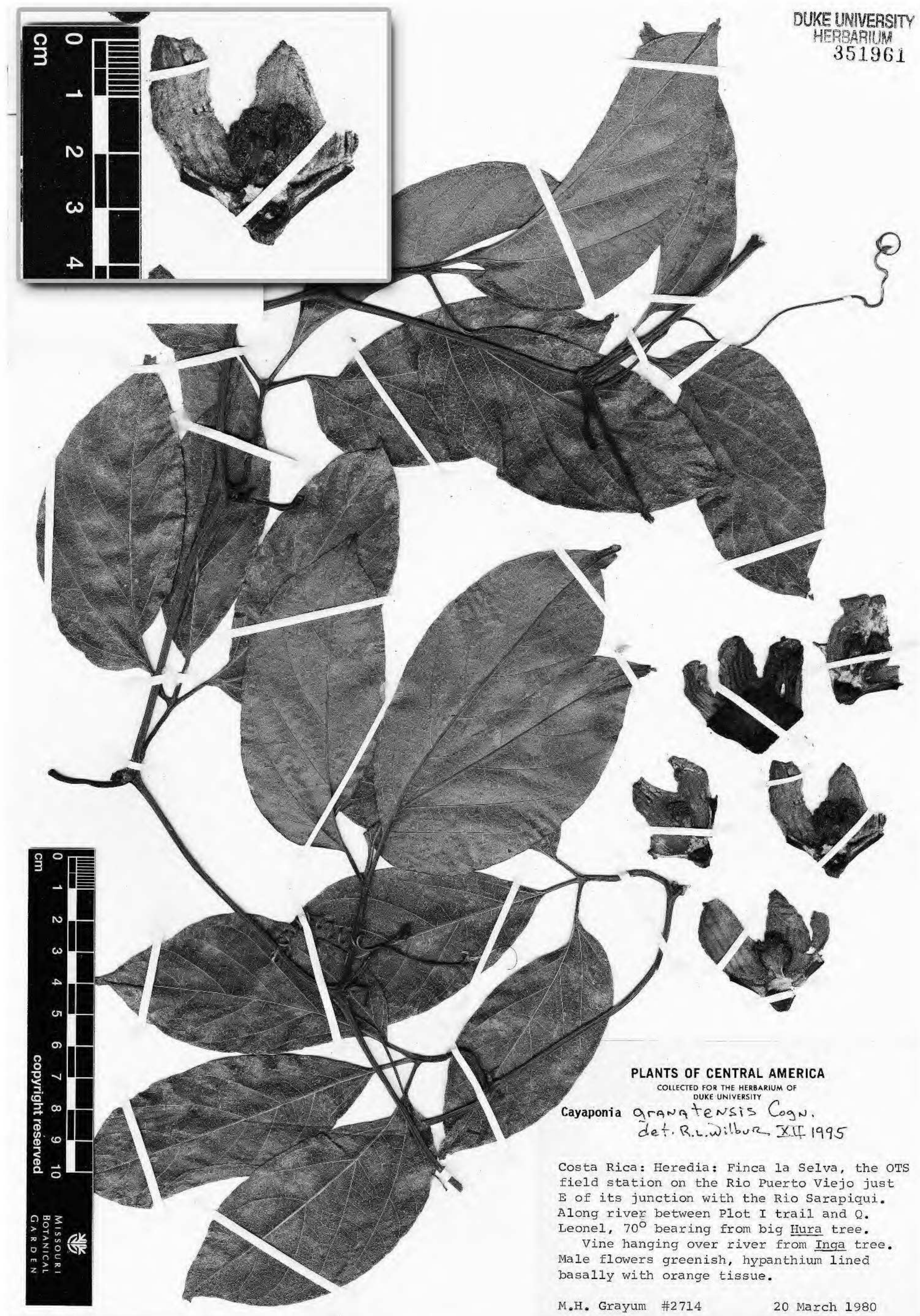


Figure 2. *Cionosicya guabubu* Grayum & J. A. González, flowering specimen (Grayum 2714, DUKE). Inset: staminate flower, with corolla partly removed to show androecium.

2- or pedately 4- or 5-foliolate), with petiolules 0.6–2(–2.3) cm; medial leaflet 6–18(–21+) × 2.8–7(–8) cm, elliptical to oblong or ± narrowly obovate, cuneate to short-attenuate at the base, ± abruptly

short-acuminate at the apex, minutely denticulate or subentire, pinnately 4- to 7-nerved, chartaceous or subcoriaceous, glabrous on both surfaces (except sometimes sparsely and minutely pubescent along



Figure 3. *Cionosicys guabubu* Grayum & J. A. González, fruiting specimen (Haber ex Bello C. & Lierheimer 4399, MO).

the major veins), minutely verruculate adaxially, uniformly glandular-punctulate abaxially and with scattered larger, immersed glands (most in proximity of midrib and major veins); lateral leaflets asymmetrical, oblique at the base, rarely coarsely dentate to

lobed basiscopically or with the lobe pedately distinct (Hammel 24504; Rojas 285). Inflorescences usually of 1 solitary flower or 2 or 3 fasciculate flowers (occasionally racemose with the rachis to ca. 5 cm). Staminate flowers ca. 35–45 mm diam., 5-merous,

with pedicel ca. 5–40 mm; hypanthium basally orange within, ca. 13–21 mm, 20–30 mm diam., broadly obconical, glabrous (or with scattered, minute trichomes along the margin), the sepals \pm erect, 1–3.5 (–8; *Chávez 504*) mm, subulate to narrowly triangular; petals distinct to near the base or connate for up to ca. 1/2 their length in a green or yellow-green, apparently campanulate corolla 11–24 mm, fleshy, longitudinally ridged externally, densely pilose-tomentose with uniseriate trichomes on both surfaces (or sometimes glabrescent within); stamens inserted in proximal 1/3 of receptacle; filaments 3, distinct, 3–5 mm, stout, with dense, unilateral tuft of uniseriate trichomes near base (on inner side); anthers coherent, forming a yellowish subglobose head (8–)12–13 mm, the thecae strongly contorted. Pistillate flowers not seen. Fruits green, sometimes (*Merello et al. 3050*) with lighter green stripes (the pulp white, cottony and juicy when ripe; *Hammel et al. 17410*), ca. 7–11 cm, oblate to globose, \pm lustrous, with pedicel 1–3.4 cm; seeds numerous (about 30 noted; *Hammel 8137*), horizontal to descending or subvertical proximally (*Haber ex Bello C. & Lierheimer 4399*; *Hammel 8137*), atropurpureous (*Gómez et al. 22767*) or black (*Hammel et al. 17410*; *Rivera & Hoomans 1753*), 15–35 \times 10–20 mm, subrectangular to oblong or narrowly elliptical, \pm strongly compressed.

Habitat and distribution. *Cionosicys guabubu* occurs in tropical wet forest (Tosi, 1969), at elevations of about 50–1200 m, in Nicaragua (two collections), Costa Rica, and central Panama (two collections). Although most collections are from the Atlantic slope, the species is also found on the Pacific slope in the northern Costa Rican cordilleras (Cordillera de Guanacaste and de Tilarán).

IUCN Red List category. Until recently, the only collections of *Cionosicys guabubu* known to us were from the La Selva Biological Station, Costa Rica, and housed at DUKE. Additional collections have since accrued to expand the geographic range, and though it is still relatively small, we can now cite records from all seven Costa Rican provinces, as well as a few from Nicaragua and Panama. As in the case of *Cayaponia hammelii*, the fate of *Cionosicys guabubu* is intertwined with that of the primary forest habitat to which it is confined. Most (if not all) of the vouchered populations of *C. guabubu* are in public or private preserves, and as long as these areas remain pristine, the species should be safe. Even though this species is presently common at some sites (e.g., in Costa Rica's Parque Nacional Braulio Carrillo), it may have declined in others (e.g., the La Selva Biological Station, where it has not been seen in nearly 30 years). Because population size and extent have not been

rigorously established or monitored for *C. guabubu* in any part of its range, it must be classified as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Phenology. Flowering has been documented from February through April, and mature fruits from February through May. At anthesis, the flowers are said to have an aroma of “mango verde” or “follaje de mango” (*Hammel 24495*).

Common name. Guabubu (*Coronado et al. 1434*, Nicaragua).

Etymology. The epithet is taken from the common name indicated on the label of *Coronado et al. 1434* (MO), from Nicaragua.

Discussion. *Cionosicys guabubu* may be recognized by its compound (typically trifoliolate) leaves; large staminate flowers, with the corolla somewhat fleshy and the anthers forming a subglobose head, with the thecae highly contorted; and oblate to subglobose fruits, with white pulp and numerous seeds. It is distinct from the other three described species of *Cionosicys* by virtue of its compound, generally trifoliolate (vs. simple and unlobed to lobed) leaves and highly contorted (vs. tightly replicate) anther thecae, and its fruits are probably the largest known in *Cionosicys*. We have no precise quantitative data on fruit size for the Jamaican *C. pomiformis*, but Grisebach (1864: 288) described the fruits as the “size of an orange.” We imagine that the orange Grisebach had in mind would be on the small side, by modern standards, while the fruits of *C. guabubu* attain nearly the size of a modern grapefruit. The key to genera of Cucurbitaceae in Adams (1972: 501) requires that the fruits of *C. pomiformis* be “about 7 cm in diameter.” The white pulp of *C. guabubu* fruits provides an additional distinction from the sympatric *C. macranthus*, the fruits of which have orange to red pulp (the fruits of the more northern *C. excisus* also have whitish pulp).

As in the case of *Cayaponia hammelii*, herbarium specimens of *Cionosicys guabubu* have often been misidentified using the catch-all name *Cayaponia granatensis*, properly applied to a species with trilobate leaves as well as smaller, berry-like fruits. In Cogniaux's (1881) key to *Cayaponia* species, *Cionosicys guabubu* keys directly to *Cayaponia petiolulata* Cogniaux, based on a specimen from Bahia, Brazil. However, the latter species differs in its much longer stamen filaments (20–30 mm) and shorter anther head (ca. 8 mm). Because of its large, subglobose fruits, *Cionosicys guabubu* has sometimes been identified as *Fevillea* L., a distantly related genus (Schaefer et al., 2009)

in subfamily Zanonioideae; *Fevillea* differs in its simple (in the two Mesoamerican species), eglandular leaves, flowers with five distinct stamens and three distinct styles, and fruits with a distal, circumferential scar.

The highly contorted anther thecae of *Cionosicya guabubu* are a particularly distinctive feature of this species. Those of *C. pomiformis* have been described as “bent upwards and downwards, with 3 parallel anfractuosities” (Grisebach, 1864: 288); “longitudinaliter triplicatis” (Cogniaux, 1881: 516); or “folded vertically into an erect column” (Adams, 1972: 501). These characterizations also accord well with published descriptions of the anthers of both *C. excisus* and *C. macranthus*, as well as many *Cayaponia* species, and corroborate our own observations. In *Cionosicya excisus* and *C. macranthus*, the anther thecae are tightly replicate vertically, forming a cylindrical head (vs. subglobose in *C. guabubu*). The allusions to verticality refer to the tight folding of the thecae in long, straight segments (which are themselves easily mistaken for whole, uncurved anthers); by contrast, no significant portion of any anther in *C. guabubu* could reasonably be characterized as “vertical” or “straight.”

We have not seen any pistillate flowers that can definitely be identified as belonging to *Cionosicya guabubu*.

The following key will suffice to distinguish those species of *Cionosicya* with validly published names:

KEY TO THE DESCRIBED SPECIES OF *CIONOSICYA*

- 1a. Leaves compound, 3(to 5)-foliolate; anthers forming a subglobose head, the thecae highly contorted; mature fruits ca. 7–11 cm *C. guabubu*
- 1b. Leaves simple, unlobed to deeply 3- to 7-lobed; anthers forming a cylindrical head, the thecae tightly folded vertically; mature fruits ca. 3–7 cm.
 - 2a. Sepals of staminate flowers 1–3(–6) mm, dentiform to narrowly or broadly triangular, broadest at base; ripe fruits with orange to red pulp; southern Mexico to Panama. *C. macranthus*
 - 2b. Sepals of staminate flowers 9–18 mm, elliptical or ovate to oblong-lanceolate, constricted at base; ripe fruits with whitish pulp (color unknown in *C. pomiformis*); southern Mexico, Belize, and Guatemala, Cuba, Jamaica.
 - 3a. Tendrils simple or 2- or 3-branched; corolla ca. 10–30 mm; Mexico, Belize, and Guatemala, Cuba *C. excisus*
 - 3b. Tendrils simple; corolla ca. 35–40 mm; Jamaica *C. pomiformis*

The relationship between *Cionosicya excisus* and *C. pomiformis* bears closer scrutiny, as these species would seem to be extremely similar, yet have apparently never been compared directly.

Paratypes. NICARAGUA. **Jinotega:** Mpio. Wiwilí, Reserva de Bosawas, comun. San Andrés, Caño Pilawas, *I. Coronado, M. Barrios, F. Rojas & G. Pérez 1434* (MO). **Zelaya [Región Autónoma del Atlántico Norte]:** Caño El Hormiguero, *J. J. Pipoly 5917* (MO). COSTA RICA. **Alajuela:** Cantón de Upala, Parque Nac. Guanacaste, Cordillera de Guanacaste, entre Quebrada Grande y Nueva Zelandia, *R. Aguilar, K. Taylor, D. García & R. Espinoza 3164* (CR, INB); Arenal Volcano, from macadamia field to river and back to base of mountain, *V. Funk et al. 10761* (CR); Z. P. Arenal-Monteverde, Río Peñas Blancas valley, Eladio’s Refugio, Monteverde Reserve, *W. Haber & E. Cruz 11962* (INB); Reserva Biol. Monteverde, Río Peñas Blancas, *W. Haber & E. Bello 8459* (CR); San Ramón, Reserva Biol. A. M. Brenes, camino de entrada a la estación, *J. Gómez-Laurito et al. 12633* (CR, USJ). **Cartago:** Sector Río Guayabo, El Ceibo, *G. Rivera & Y. Hoomans 1753* (CR, USJ). **Guanacaste:** Parque Nac. Guanacaste, Cordillera de Guanacaste, Cerro Cacao, Estación Cacao, *C. Chávez 504* (INB); La Cruz Cantón, along trail from Estación Pitilla to ridge SW thereof, Cordillera de Guanacaste, *M. H. Grayum 12928* (INB, MO); El Dos de Tilarán, 4 km N, Cerro La Chirripa, Atlantic slope rain forest, *W. A. Haber ex E. Bello C. & L. Lierheimer 4399* (MO); Parque Nac. Guanacaste, Estación Pitilla 4.5 km al N, hacia Finca La Pasmompa, *B. Hammel, M. Chavarría, G. Herrera, R. Robles & Grupo de Estudiantes de Biodiversidad 17410* (INB). **Heredia:** Finca La Selva, OTS Field Station on Río Puerto Viejo just E of jct. with Río Sarapiquí, *M. H. Grayum 2714* (DUKE [2]), *B. Hammel 7856* (DUKE), *B. Hammel 8009* (DUKE [2], LSCR), *B. Hammel 8137* (DUKE). **Limón:** Cantón de Talamanca, Alto Lari, entre Río Dapari y Río Lari, *R. Aguilar & H. Schmidt 1020* (CR, INB); Río Segundo, Asunción, *J. Berrocal et al. 41* (CR); path beyond Río Sucio, Braulio Carrillo, *L. D. Gómez P., I. A. Chacón G. & G. Herrera Ch. 22767* (CR); Parque Nac. Braulio Carrillo, Sendero Botarama, Quebrada González, *B. Hammel 24495* (INB), *B. Hammel & R. Hammel 24482* (INB); A. C. Llanuras de Tortuguero, Pococí, Estación Aguas Frías, *E. Rojas 285* (INB). **[Puntarenas:]** Cedral de Montes de Oro, Mar. 1959, *Lankester & Jiménez s.n.* (CR 41408). **San José:** Parque Nac. Braulio Carrillo, ca. 1 km carretera arriba del puente sobre el Río Sucio, *B. Hammel 24504* (INB). PANAMA. **Colón:** Teck Cominco Mining Concession, Colina Camp, *M. Merello, J. J. Calvache & J. I. González 3050* (MO); Teck Cominco Petaquilla mining concession, *G. McPherson 19825* (MO).

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